forestry in its modern sense is not a new, untried experiment in Germany, but that care and active legislative consideration of forest wealth date back more than four centuries; that the accurate official records of several states for the last one hundred years prove conclusively that wherever a systematic, continuous effort has been made, as in the case of all state forests, whether of large or small territories, the enterprise has been successful; that it has proved of great advantage to the country, furnished a handsome revenue where otherwise no returns could be expected; led to the establishment of permanent wood-working industries, and has given opportunity for labor and capital to be active, not spasmodically, not speculatively, but continuously and with assurance of success. This rule has, fortunately, not a single exception. It is a highly significant fact, however, that even in Prussia, where the state is exhausting all ameliorative and persuasive means, over 75,000 acres have been deforested by private owners during the last twenty years. The state finally buys these half-wastes, restocks them at great expense, and thus public money pays for public folly in not restricting ill use of forest properties.

It is interesting to note that Japan had a forest policy earlier than any of the European nations, and has now a department of forestry controlling the management of 17,500,000 acres, or thirty per cent. of the total forest area. A forest academy has been connected with the University of Tokio since 1890.

The concluding chapters are devoted to forest conditions and the forestry movement in the United States. An area of 500,000,000 acres represents practically the forest territory of this country capable of timber production, much of it 'culled' forests from which a large part of the merchantable timber has been removed. The forest reservations of the federal government to July 1, 1902, comprise nearly 60,000,000 acres, or about one per cent. of the public domain, including brush lands, grazing lands, and desert. The state of New York owns over one and a quarter million acres and is increasing the area of the state forest, and Pennsylvania has entered upon the same policy; but in the other states forest property is still almost entirely in private hands. It is not to our credit that conservative lumbering is thus far hardly more than a name in the United States, and in most cases the policy of 'skinning,' *i. e.*, culling out the merchantable timber, prevails. It is, however, a hopeful feature of the situation that corporations and wealthy capitalists are beginning to see the financial advantages of the future in forest properties, that sporting associations are also becoming interested in forest preservation, and that the long period of agitation is finally passing into one of scientific study of our resources, with at least here and there commendable and measurably adequate legislation. It has become at last the policy of the United States government to take care of its long-neglected forest lands, but the administration of the forest reserves is still in an embryonic condition under the General Land Office, while the survey and description of forest reservations are conducted under the agency of the Geological Survey, instead of having the whole matter under the one head, namely the Forestry Bureau of the Department of Agriculture, an anomalous condition of affairs that can hardly prevail much longer.

It need hardly be said that this authoritative exposition of the economics of forestry, with the applications that have been made to present conditions and needs in the United States, can not fail to render most important service at a time when the great majority of intelligent citizens freely acknowledge the pressing necessity of a forward movement, but, in nine cases out of ten, are either hopelessly in the dark or extremely ill-advised as to the steps that ought to be taken.

V. M. Spalding.

SOCIETIES AND ACADEMIES.

MEETING OF THE CHICAGO SECTION OF THE AMERICAN MATHEMATICAL SOCIETY.

The twelfth regular meeting of the Chicago section of the American Mathematical Society was held on Friday and Saturday, January 2 and 3, at the University of Chicago. The meeting was presided over by Professor

H. B. Newson, of the University of Kansas. The following papers were read:

DR. SAUL EPSTEEN, University of Chicago: 'Determination of the group of rationality of a differential equation.'

PROFESSOR E. W. DAVIS: 'A group in logic.'

PROFESSOR H. B. NEWSON: 'On the generation of finite from infinitesimal transformations; a correction.'

PROFESSOR L. E. DICKSON, University of Chicago: 'The ternary orthogonal group in a general field.'

PROFESSOR L. E. DICKSON, University of Chicago: 'The group defined for a general field by the rotation groups.'

PROFESSOR A. S. HATHAWAY, Rose Polytechnic Institute: 'Vector Analysis.'

PROFESSOR JAMES BYRNIE SHAW, Kenyon College: 'On nilpotent algebras' (preliminary communication).

PROFESSOR D. F. CAMPBELL, Armour Institute of Technology: 'On homogeneous quadratic relations in the solution of a linear differential equation of the fourth order.'

DR. S. E. SLOCUM, University of Cincinnati: 'Relation between real and complex groups with respect to their structure and continuity.'

PROFESSOR ARNOLD EMCH, University of Colorado: 'On the involution of stresses in a plane.'

MR. R. E. WILSON, Northwestern University: 'Polar triangles of a conic and certain circumscribed quartic curves' (preliminary communication).

PROFESSOR H. S. WHITE, Northwestern University: 'Orthogonal linear transformations and certain invariant systems of cones' (preliminary communication).

PROFESSOR R. E. ALLARDICE, Leland Stanford University: 'On the envelopes of the axes of similar conics through three fixed points.'

The report of the committee appointed at the last Christmas meeting to devise a scheme of uniform requirements for the Master's degree for candidates making mathematics their major subject, was discussed, and portions of it adopted, the remainder being held over for consideration at the next meeting of the section. The report deals with the undergraduate program and suggests a basis for graduate study on the assumption that one year of such study will be required for the Master's degree. Copies of the report may be had from the secretary of the section.

The following officers were elected for the ensuing year:

Secretary—Professor Thomas F. Holgate.

Additional Members of the Program Committee—Professor Ernest B. Skinner and Dr. S. E. Slocum.

The next meeting of the section will be held in April.

THOMAS F. HOLGATE,
Secretary of the Section.

EVANSTON, ILLINOIS.

GEOLOGICAL SOCIETY OF WASHINGTON.

AT the 136th meeting of the society, held in assembly hall of the Cosmos Club, Wednesday evening, January 14, 1903, the following program was presented:

Dr. Arthur C. Spencer exhibited some specimens of metallic copper taken from the crevices of an old wall which had been covered for perhaps thirty years by sulphide-bearing débris from the mines at Cobra, near Santiago, Cuba. A calcareous mortar was locally replaced by copper, which now occurs without admixture of any foreign material.

The chemical reactions involved were discussed by Dr. H. N. Stokes, who has recently been engaged in an extensive study of the conditions under which metallic sulphides are deposited.

In a brief review of the history of the work on ore deposits, in America particularly, Mr. S. F. Emmons introduced Mr. W. H. Weed, who proposed a genetic classification of ore deposits, whose major subdivisions are as follows:

I. Igneous (Magmatic segregations).
   A. Silicious.
   B. Basic.

II. Igneous emanation deposits (deposited by highly heated vapors and gases in large part above the critical point, *e. g.*, 365° and 200 atm. for H_2O).
   A. Contact metamorphic deposits.
   B. Veins (closely allied to magmatic veins and to division IV.).

III. Fumarolic deposits (metallic oxides, etc., in clefts in lavas; no commercial importance).

IV. Gas-aqueous (pneumato-hydato-genetic) deposits. Igneous emanations mingled with ground-waters.
  A. Filling deposits.
  B. Replacement deposits.

V. Meteoric waters.
  A. Underground.
  B. Surficial.

This classification is intended to group the geological processes forming ore deposits in such a manner as to show genetic relations, and to illustrate the subdivisions proposed by actual examples, it being understood that investigators will differ as to which class a particular deposit might be assigned.

Major subdivisions are based upon magmatic segregations at one end, and cold aqueous deposits at the other, with intermediate groups due to the emanations from igneous rock, the eruptive after-actions of Vogt, to which the term pneumatolytic has commonly been given; fumarolic when these emanations issue at low temperature and pressure; gas-aqueous in which the emanations from igneous rocks, with their burden of metals, mingle with ground-water; aqueous in which meteoric waters alone are active, both chemically and mechanically.

The igneous deposits are divided into basic and silicious, the former including the deposits of iron, copper, etc., found at igneous borders and as dikes, the latter the ore-bearing pegmatites with quartz veins as extreme examples. Under igneous emanations or pneumatolytic deposits are grouped contact metamorphic deposits shown by recent studies to be formed under conditions which preclude the presence of ordinary ground-waters or steam at a low temperature and pressure. Pneumatolytic veins, of which Cornwall tin veins are classic examples, have long been recognized as due to eruptive after-actions of this character. Geikie, Fouque and other geologists have observed the formations of metallic oxide in clefts in lavas by fumaroles, hence this division is introduced.

Under gas-aqueous the larger number of workable deposits occur, and it would be necessary to present a long list of facts assembled to show their relations and the deductions therefrom, to establish the necessity for this subdivision; but if eruptive after-effects are admitted to form contact metamorphic deposits, etc., the next group follows as a logical consequence.

Meteoric waters are admittedly the agents that have by themselves formed large and important deposits of iron and copper, but this agency is assigned to a less important place than given it by recent writers. As a whole, the classification differs very markedly from any so far proposed, being the first to recognize the facts established by Vogt, Lindgren, Kemp, Spurr and other advocates of the igneous origin of ores.

In the discussion of Mr. Weed's paper, Mr. J. E. Spurr presented to the society a genetic classification of ore deposits, upon which he has been engaged for some years. He pointed out a general similarity between this and the classification proposed by Mr. Weed, especially as regards the important place given to ore deposits formed directly by igneous processes, and the classes into which these deposits are divided, the differences between the two schemes being largely differences in relative importance of the subdivisions and in detailed grouping. Mr. Spurr expressed his full sympathy with the theories of igneous origin for ore deposits, and recalled his own advocacy of these theories as early as 1894, when, in describing the deposits of Mercur, Utah, a gaseous origin for one of the two types found there was proposed, and a deposit in limestone along a porphyry contact by waters occluded from the porphyry for the other. Again in 1896 he argued that the gold quartz veins of the Yukon district were the final silicious products of differentiation of a granitic magma.

In his continuation of the discussion Mr. Waldemar Lindgren admitted the desirability of a genetic classification and believed that the suggestions of Weed and Spurr should be followed. Deposits formed by water above the critical temperature by igneous emanations and those formed by mingling of atmospheric and igneous water are important divisions. Fumaroles and solfataras are surface phenomena and very different from deep-seated

emanations. The conception of 'mineralizing agents' was defined, and it was shown that they may be active in magma, liquids and gases as well as in the reaction of gases on solids. A better term is desirable for deposits formed above the critical temperature of water than the variously used word 'pneumatolytic.' Contact metamorphic deposits are probably directly caused by the action of igneous emanations from cooling magmas, chiefly water, on the surrounding rocks at a temperature above the critical point.

W. C. MENDENHALL,
Secretary.

CLEMSON COLLEGE SCIENCE CLUB.

THE club held its regular monthly meeting on Friday evening, January 16. The following papers were presented and discussed:

'The Salient Points in the Bacterial Analysis of Milk,' by Professor H. Metcalf. This paper described the conventional methods of milk analysis and was fully illustrated by experiments.

'Prescription Milk,' to which the first paper served as an introduction, was presented by Professor C. O. Upton. The treatment of this subject was based entirely upon the speaker's experience in the Walker-Gordon Laboratory Co., where the production of milk for clinical use is made a special work.

CHAS. E. CHAMBLISS,
Secretary.

DISCUSSION AND CORRESPONDENCE.

ORTHOPLASY, ETC.

IN SCIENCE, November 21, p. 820, Professor Conn treats 'Organic Selection' as a synonym of 'Orthoplasy,' stating that Professor Baldwin has prefered the latter term. In the work of Professor Baldwin reviewed (pp. 151, 152) we find these definitions:

"Organic Selection: The perpetuation and development of congenital variations in consequence of individual accommodation.

"Orthoplasy: The directive or determining influence of organic selection in evolution."

On p. 173 we read: 'The theory of evolution which makes general use of organic selection is called Orthoplasy.' Orthoplasy is, therefore, not identical with organic selection, but its result.

I will take this opportunity to suggest a couple of terms:

Directive Characters.—Those characters which may be useless or harmful to the individual at the time of their development, but lead to after-effects which are the cause of survival, or are at least beneficial. Example: a wandering or migratory habit might be the cause of much hardship, but in the long run might lead the individual (if he survived the early stress) to exceptionally favorable conditions. Human emigrants often illustrate this course of events.

Directive Individuals.—Those individuals which may be useless or harmful to the race during their lifetimes, but lead to after-effects which are the cause of race-survival, or are at least beneficial. Example: many reformers, such as the abolitionists, have by their actions weakened the nation to which they belonged, for the time being; but the ultimate results have been highly advantageous.

T. D. A. COCKERELL.

EAST LAS VEGAS, N. M.

SHORTER ARTICLES.

ON THE PRIMARY DIVISION OF THE REPTILIA INTO TWO SUB-CLASSES, *Synapsida* AND *Diapsida.*

SINCE 1867 there has been a slowly progressive movement toward the classification of the reptiles by the number of arches in the temporal region of the skull. The leaders have been Günther, in the separation of the Rhyncocephalia from the Lacertilia, Cope, in the union of the Archosauria and separation of the Cotylosauria, Baur, Smith Woodward and Broom in the suggested division of reptiles into two groups according to the presence of one or two temporal arches. Broom in 1901 went so far as to assign a phylogenetic value to this distinction.

Without learning until a few days ago of Broom's paper* the writer had been for some time studying the value of this idea. Classification by single characters, such as the above,

* Through a review kindly sent the writer by Franz Baron Nopsca, Jr., and received February 7, 1903.